EUR REVISION E Manual

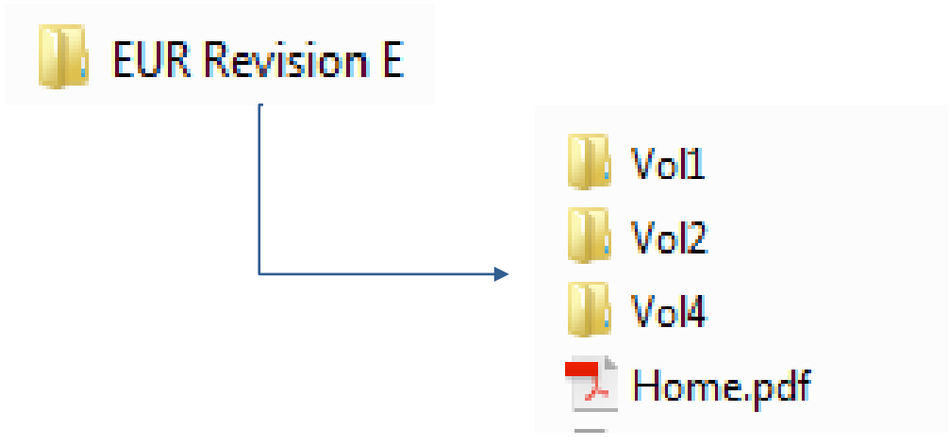
How to use the EUR Document

Setups

1. **Download the EUR Revision E Document containing:**

- « Home.pdf » file;
- « Vol1 » folder (Chapters 1.1 to 1.4, Acronyms, Definitions);
- « Vol2 » folder (Chapters 2.1 to 2.20); and
- « Vol4 » folder (Chapters 4.1 to 4.6).

2. **Create an « EUR Revision E » folder on your computer and ensure that the EUR files are placed on your computer as follows:**



3. **Open the « Home.pdf » file**

« Home » file

EUROPEAN UTILITY REQUIREMENTS FOR LWR NUCLEAR POWER PLANTS

Revision E : Volumes 1, 2 & 4

Volume 1

1.1 - Introduction to EUR
1.2 - EUR policies
1.3 - EUR synopsis
1.4 - EUR key issues

Definitions
Acronyms

Volume 2

2.1 - Safety requirements
2.2 - Performance requirements
2.3 - Grid requirements
2.4 - Design basis
2.5 - Codes and Standards
2.6 - Material-related requirements
2.7 - Functional requirements : components
2.8 - Functional requirements : systems & processes
2.9 - Containment system
2.10 - Instrumentation & Control and Human-Machine Interface
2.11 - Layout
2.12 - Design process and documentation
2.13 - Constructability and commissioning
2.14 - Operation, maintenance & procedures
2.15 - Quality assurance
2.16 - Decommissioning
2.17 - PSA Methodology
2.18 - Performance assessment methodology
2.19 - Cost assessment information requirements
2.20 - Environmental impact

Volume 4

4.1 - Introduction to the Volume 4
4.2 - Main turbine generator systems
4.3 - Steam, condensate and feedwater system
4.4 - Electric power systems
4.5 - Circulating water systems
4.6 - Auxiliary systems

Each title is a hyperlink to the corresponding EUR Chapters

How to navigate through the EUR Document (1/3)

Direct access to the « Home » file

Direct access to the «Table of content » of the EUR Chapter

Search inside the EUR Chapter

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Direct access to “Definitions” Chapter

Direct access to “Acronyms” Chapter

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Section	Requirement	Nuclear/Turbine/Common	Section comment	Last change
2.2 1	**TYPE AND PLANT SIZE**			E-01
A	The Nuclear Power Plant (NPP) shall be a Light Water Reactor (LWR) type, either with a Pressurised Water Reactor (PWR) or a Boiling Water Reactor (BWR) Nuclear Steam Supply System (NSSS).	C	A1 The European Utility Requirements (EUR) are aimed at the next generation of NPP to be built in Europe. They deal only with LWR plants. The EUR Utilities* remain open-minded to new designs but at the moment they focus their attention on LWR designs. A2 Other types of plants are not considered to have shown sufficient operating experience to be built, licensed and operated in Europe in the short term. A3 The requirements cover both PWR and BWR power plants, including those with Passive Systems*.	
B	The NPP shall be in the medium-large and large size ranges, from 600 MW up to 1800 MW nominal gross power output.	C	B1 This power range is believed to be the current economic range of reactors, however EUR may be used for NPPs above and below this range with suitable engineering assessment by the Utility* and Designer*. B2 Large output is well suited to the western Europe environment where the sites available for building nuclear power plants tend to be sparse and often small. In most countries the network of the existing high voltage transmission grid tends to be quite dense and enables large power stations to be built. There are difficulties in building new high voltage transmission lines in many countries. B3 The upper value (1800 MW) is seen as the size limit for LWR plants corresponding to the needs of a majority of European Utilities*, above this size, it would become more difficult to guarantee the resilient behaviour of the high voltage transmission grid upon tripping of one Unit* on certain sites. Also a step increase in the size of plants compared to the largest current designs would likely require specific technical developments.	

How to navigate through the EUR Document (2/3)

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Volume 2 Chapter 2

PERFORMANCE REQUIREMENTS

Revision E December 2016

Section	Requirement	Nuclear/Turbine/Common	Section comment	Last change
B	Provisions and features designed to cope with Design Basis Accidents* and Design Extension Conditions* (DEC) shall not be detrimental to easy and simple operation in Normal Operation*.	C	B1 However, nuclear safety provisions have priority over easy and simple operation.	
C	Conditions for operation of the plant from the grid perspective are found in Chapter 2.3	C	C1 See Chapter 2.3 Section 2.3.2 See Chapter 2.3 Section 2.3.3	
2.2 2.1	**Cool down, start-up and loading of the plant**			E-01
2.2 2.1.1	**Duration of cool down**			E-01
A	The plant should be capable of shutdown from Hot Zero Power* to Cold Shutdown Mode* at a temperature less than 60°C within 16 hours and the cooling period shall be no longer than 24 hours.	C	A1 This cool-down time assumes that all normal cool-down equipment, including the Steam Generators* (SGs) in PWRs and the main condenser in BWRs are in service. A2 Delays resulting from special test or administrative procedures which are not part of a normal shutdown are not included in these time-related requirements. A3 Less than 60°C is a temperature suitable for personnel intervention during refuelling operation.	
B	The removal of the Reactor Pressure Vessel* (RPV) head shall be achieved within: • 32 hours after reactor trip for BWR; or • 72 hours after reactor trip for PWR.	N		

Click to move to this Chapter or Section

Click to read the Acronym

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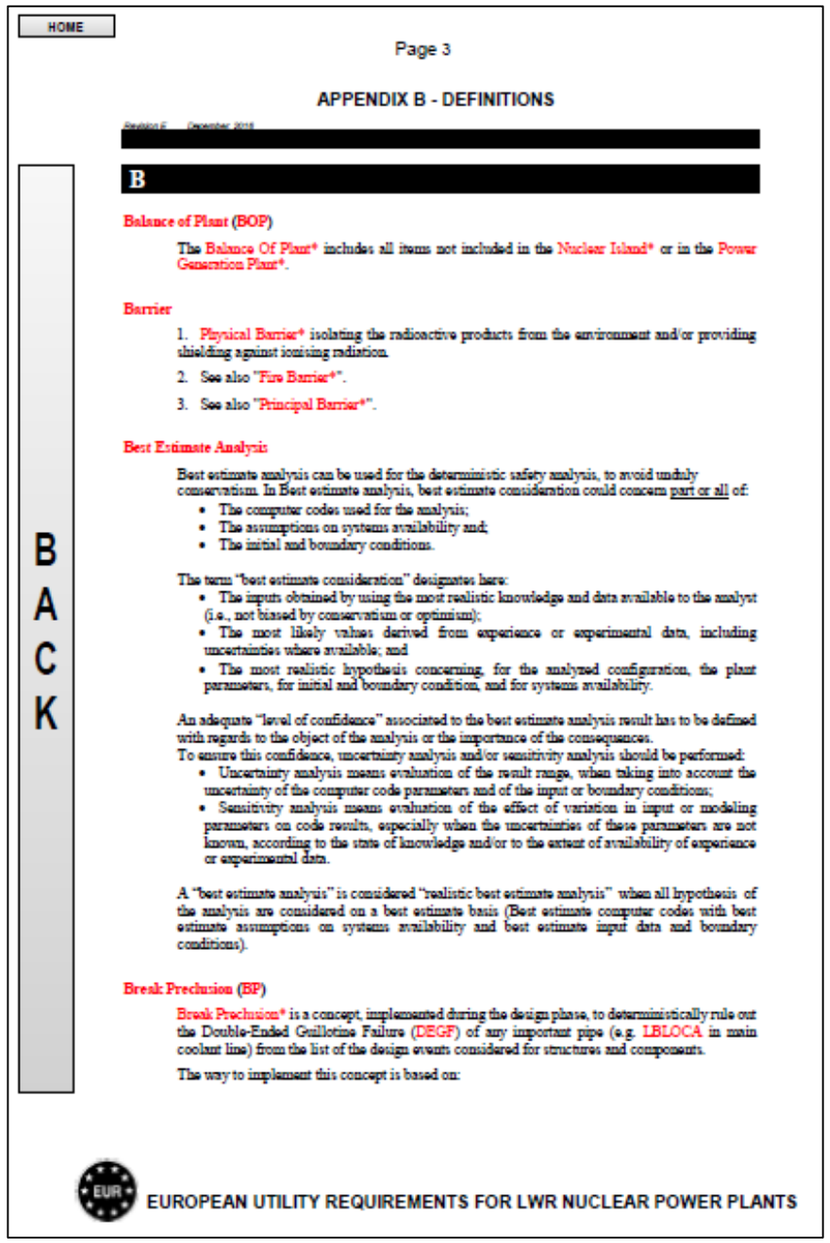
How to navigate through the EUR Document (3/3)

After reading an Acronym or a Definition, click on the “BACK” link to return to the previous EUR chapter.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APPENDIX B - DEFINITIONS

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B

Balance of Plant (BOP)

The Balance Of Plant* includes all items not included in the Nuclear Island* or in the Power Generation Plant*.

Barrier

1. Physical Barrier* isolating the radioactive products from the environment and/or providing shielding against ionising radiation.
2. See also "Fire Barrier*".
3. See also "Principal Barrier*".

Best Estimate Analysis

Best estimate analysis can be used for the deterministic safety analysis, to avoid unduly conservatism. In Best estimate analysis, best estimate consideration could concern part or all of:

- The computer codes used for the analysis;
- The assumptions on systems availability and;
- The initial and boundary conditions.

The term "best estimate consideration" designates here:

- The inputs obtained by using the most realistic knowledge and data available to the analyst (i.e., not biased by conservatism or optimism);
- The most likely values derived from experience or experimental data, including uncertainties where available; and
- The most realistic hypothesis concerning, for the analyzed configuration, the plant parameters, for initial and boundary condition, and for systems availability.

An adequate "level of confidence" associated to the best estimate analysis result has to be defined with regards to the object of the analysis or the importance of the consequences.
To ensure this confidence, uncertainty analysis and/or sensitivity analysis should be performed:

- Uncertainty analysis means evaluation of the result range, when taking into account the uncertainty of the computer code parameters and of the input or boundary conditions;
- Sensitivity analysis means evaluation of the effect of variation in input or modeling parameters on code results, especially when the uncertainties of these parameters are not known, according to the state of knowledge and/or to the extent of availability of experience or experimental data.

A "best estimate analysis" is considered "realistic best estimate analysis" when all hypothesis of the analysis are considered on a best estimate basis (Best estimate computer codes with best estimate assumptions on systems availability and best estimate input data and boundary conditions).

Break Preclusion (BP)

Break Preclusion* is a concept, implemented during the design phase, to deterministically rule out the Double-Ended Guillotine Failure (DEGF) of any important pipe (e.g. LBLOCA in main coolant line) from the list of the design events considered for structures and components.

The way to implement this concept is based on:

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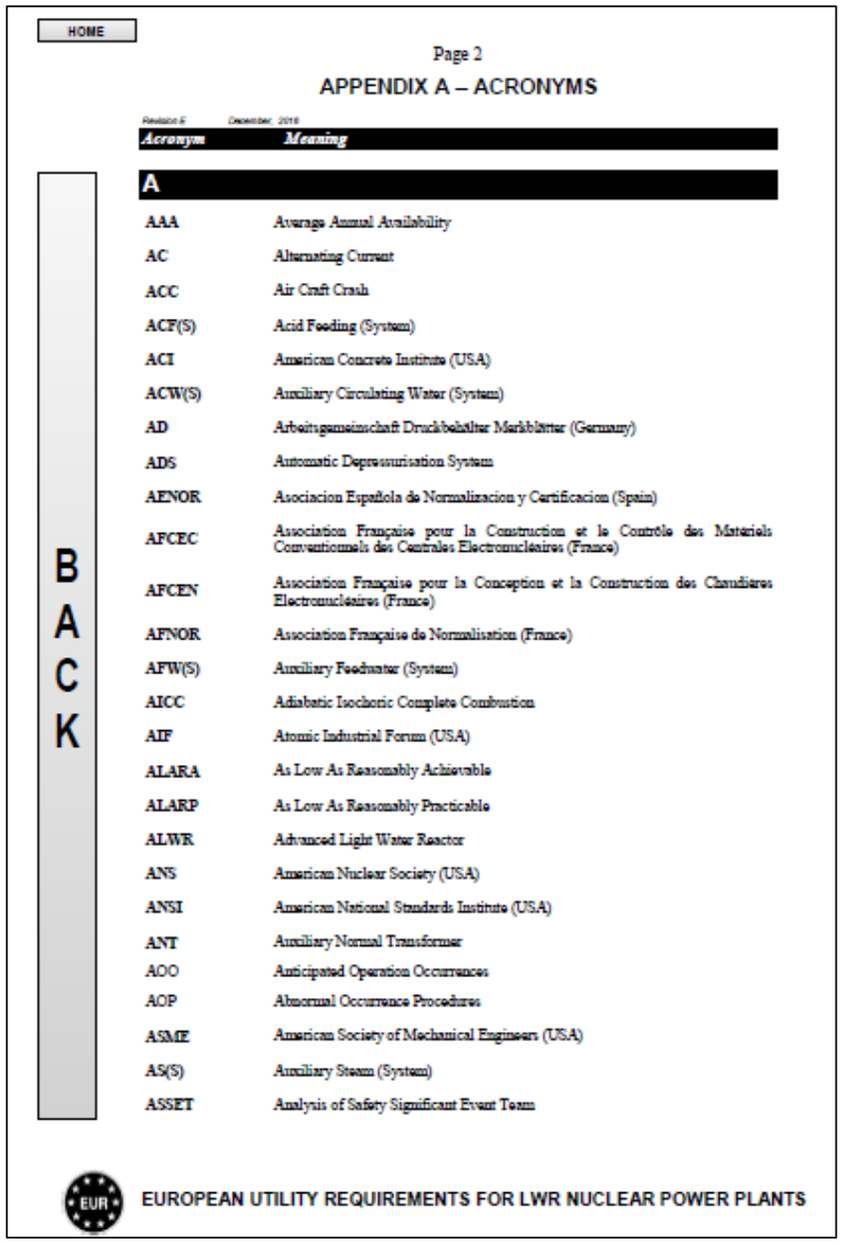
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APPENDIX A – ACRONYMS

Revision F December 2016

Acronym	Meaning
A	
AAA	Average Annual Availability
AC	Alternating Current
ACC	Air Craft Crash
ACF(S)	Acid Feeding (System)
ACI	American Concrete Institute (USA)
ACW(S)	Auxiliary Circulating Water (System)
AD	Arbeitsgemeinschaft Druckbehälter Merkblätter (Germany)
ADS	Automatic Depressurisation System
AENOR	Asociacion Española de Normalizacion y Certificacion (Spain)
AFCEC	Association Française pour la Construction et le Contrôle des Matériels Conventionnels des Centrales Electronucléaires (France)
AFCEN	Association Française pour la Conception et la Construction des Chaudières Electronucléaires (France)
AFNOR	Association Française de Normalisation (France)
AFW(S)	Auxiliary Feedwater (System)
AICC	Adiabatic Isochoric Complete Combustion
AIF	Atomic Industrial Forum (USA)
ALARA	As Low As Reasonably Achievable
ALARP	As Low As Reasonably Practicable
ALWR	Advanced Light Water Reactor
ANS	American Nuclear Society (USA)
ANSI	American National Standards Institute (USA)
ANT	Auxiliary Normal Transformer
AOO	Anticipated Operation Occurrences
AOP	Abnormal Occurrence Procedures
ASME	American Society of Mechanical Engineers (USA)
AS(S)	Auxiliary Steam (System)
ASSET	Analysis of Safety Significant Event Team

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EUR EUROPEAN UTILITY REQUIREMENTS FOR LWR NUCLEAR POWER PLANTS